

MA 341 Applied Differential Equations I

Lecture details

Section 601 Course lectures are available to watch at <http://wolfware.ncsu.edu>
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Office Hours: In-person SAS 3240: M: 9:30-10:30, T: 9:30-10:00, H: 9:30-10:00, F: 9:30-10:30
Over Zoom: W 1:30-2:30pm
Moodle page: <https://wolfware.ncsu.edu>
WeBWorK: <https://wolfware.ncsu.edu>

Course text

Fundamentals of Differential Equations and Boundary Value Problems, by Nagle, Saff, and Snider, 7th Edition, Addison-Wesley.

Catalog Description

Prerequisite: MA 242 or (MA 132 and MA 231)

Differential equations and systems of differential equations. Methods for solving ordinary differential equations including Laplace transforms, phase plane analysis, and numerical methods. Matrix techniques for systems of linear ordinary differential equations. Credit is not allowed for both MA 301 and MA 341.

Learning Objectives

Upon successful completion of this course, students will be able to:

- Determine if a given function is a solution to a particular differential equation; apply the theorems for existence and uniqueness of solutions to differential equations appropriately;
- Distinguish between
 - (a) linear and non-linear differential equations;
 - (b) ordinary and partial differential equations;
 - (c) homogeneous and non-homogeneous differential equations;
- Solve ordinary differential equations and systems of differential equations using:
 - (a) Direct integration
 - (b) Separation of variables
 - (c) Methods of undetermined coefficients and variation of parameters
 - (d) Laplace transform methods
- Determine particular solutions to differential equations with given initial conditions.
- Analyze real-world problems such as motion of a falling body, compartmental analysis, free and forced vibrations, etc.; use analytic technique to develop a mathematical model, solve the mathematical model and interpret the mathematical results back into the context of the original problem.
- Apply matrix techniques to solve systems of linear ordinary differential equations with constant coefficients.
- Find the general solution for a first order, linear, constant coefficient, homogeneous system of differential equations; sketch and interpret phase plane diagrams for systems of differential equations.

Grading Policy

The grading will be assigned on a 10-point scale: **A: 90 – 100, B: 80 – 89, C: 70 – 79, D: 60 – 69, F: ≤ 60**

The cutoffs for the +/- grades are determined at the end of the semester. Your final grade in this course will be determined by marks earned on the final exam, three term tests, online homework assignments, and in-class quizzes. The weighting of these components are as follows:

Homework = 15 %
Three term tests = 50 %
Final Exam = 35 %

Term Tests 50%

There will be three closed book, closed notes tests that are administered by a testing proctor (information below).

Calculators of any kind are not permitted on tests or the final exam. You may choose either of the dates listed below to take the test. If you are ill on both of the test days, you will need to present a doctor's note to reschedule. If you are out of town on a test day, set up a time with a proctor in your intended location so that you can still take the test.

Test 1: February 8 or February 9

Test 2: March 6, or March 7, or March 8

Test 3: April 11 or April 12

Attendance will be determined by timely video completion. If you have no more than 3 absences and have taken all the tests, your lowest test grade will be replaced with your final exam grade assuming it is higher.

Proctors:

Those students who live more than 50 miles from Raleigh, NC do not have to take their tests on NCSU campus. They may use a proctor in their town for testing. The proctor must be approved in advance through the Distance Education office. It can take up to a week to verify a proctor and set up all needed contact info, so please do this early! Visit the remote proctor website at:

https://online-distance.ncsu.edu/current_students/testing-services/testing-services-remote/

to set up this service. (If the link doesn't work, copy and paste the address into your web browser.)

Those students who live less than 50 miles from Raleigh, NC will take their tests on campus through Distance Education Testing Centers. Testing will be done by appointment only. Students should be mindful of closing hours for at the testing center and give themselves plenty of time to complete their exams. No students will be allowed to check-in for exams less than 30 minutes before closing time and all tests must be turned in before the facility closes.

For more information on location and hours of operation, please visit the On Campus Proctor website at https://online-distance.ncsu.edu/current_students/testing-services/testing-services-on-campus (If the link doesn't work, copy and paste the address into your web browser.)

Final Exam 35%

The final exam is mandatory and cumulative. It will be on April 24 or April 25 or April 26. The only way to take the final exam at another time is to request a change through the Department of Registration and Records, 1000 Harris Hall.

Homework Assignments will be completed on-line using an Internet-based homework service called WeBWorK. I will send out reminders when you have upcoming assignments.

Corrections to the grading

The responsibility for grading tests resides with the Teaching Assistant for this section. After the tests are returned, you have 3 days to look them over and compare them to the solutions online. If you believe an error has been made in grading on a test, you need to notify me within those 3 days. Grade changes will not occur outside of this timeframe. Do not alter the original work!

Students with disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services: <https://dro.dasa.ncsu.edu> Please let me know how I can better accommodate you.

Academic Integrity Statement and Academic Dishonesty

I assume that anything turned in with your name on it is your own work. Each time you submit a test, homework, quiz, or WebWork assignment, you affirm the honor pledge, "I have neither received unauthorized aid nor given aid on this assignment." The minimum penalty for cheating is a grade of zero on the assignment; violators will be reported to the Academic Integrity Board, which can impose additional sanctions. The code of student conduct can be found at: <https://policies.ncsu.edu/policy/pol-11-35-01>

Non-Discrimination Policy

NC State prohibits discrimination, harassment, and retaliation that are based upon a person's race, color, religion, sex, national origin, age, disability, gender identity, sexual orientation, or veteran status. If you feel that you have been the subject of prohibited discrimination, harassment, or retaliation, you should contact the Office for Institutional Equity and Diversity (OIED) at 919-515-3148.

NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or <http://oied.ncsu.edu/divweb>.

COVID ADDENDUM:

Due to the Coronavirus pandemic, public health measures have been implemented across campus. Students should stay current with these practices and expectations through the Protect the Pack website:

<https://www.ncsu.edu/coronavirus/>

The sections below provide expectations and conduct related to COVID-19 issues.

Health and Participation in Class:

We are most concerned about your health and the health of your classmates and instructors. If you test positive for COVID-19, or are told by a healthcare provider that you are presumed positive for the virus, please work with your instructor on health accommodations and follow other university guidelines, including self-reporting (Coronavirus Self Reporting): Self-reporting is not only to help provide support to you, but also to assist in contact tracing for containing the spread of the virus.

MA341 Tentative Schedule

Week	Sections	Topics
Jan. 8–12	1.1–1.2 1.3 2.2	Solutions & Initial Value Problems (Video 1) Direction Fields and Phase Line Supplement (Video 2) Separable Equations (Video 2)
Jan. 15 Jan. 16–19	2.3	Martin Luther King Day: No Class Linear First Order Equations (Video 3)
Jan. 22–26	3.2,3.3 2.4	Applications (Video 4) Exact Equations (Video 5)
Jan. 29–Feb. 2	4.2 4.3 4.4	Homogeneous Linear Eqs. Constant Coefficients: Real Roots (Video 6) Homogeneous Linear Eqs. Constant Coefficients: Complex Roots (Video 6) Undetermined Coefficients (Video 7)
Feb. 5–9	4.5	Superposition Principle (Video 8) Test 1: Thursday February 8 or Friday February 9
Feb. 12 Feb. 13 Feb. 14–16	4.6 4.9	Variation of Parameters (Video 9) Wellness Day: No Class Springs (Video 10)
Feb. 19–23	7.2–7.3 7.4	Laplace transform: definition and properties (Video 11) Inverse Laplace Transform (Video 12)
Feb. 26–Mar. 1	7.5 7.6	Solving IVPs with Laplace transforms (Video 13) Transforms of Discontinuous Functions (Video 14)
Mar. 4–8	9.1–9.3	Systems of Differential Equations and Linear Algebra (Video 15) Test 2: Wed March 6 or Thurs March 7 or Friday March 8
Mar. 11–15		Spring Break: No Class
Mar. 18–22	9.4 9.5	Linear Systems in Normal Form (Video 16) Linear Systems with Constant Coefficients: Real Eigenvalues (Video 17)
Mar. 25–29	9.6 9.7	Linear Systems: Complex Eigenvalues (Video 18) Nonhomogeneous Linear Systems (Video 19)
Apr. 1–5	9.7 5.6	Applications: Interconnected Tanks (Video 19) Coupled Mass-Spring Systems (Video 20)
Apr. 8–12	5.4	Phase Plane (Video 21) Test 3: Thursday April 11 or Friday April 12
Apr. 15–19	12.2 12.3	Linear Systems in the plane (Video 21) Almost Linear Systems (Video 22)
Apr. 22–23 Apr. 24 April 24 or April 25 or April 26		Review (Video 23) Reading Day Final Exam

Good Luck!